terms with their Government that they have been able to establish a permanent industry protected from outside competition.

In the meantime, so far as we have been able to gather, this country is doing nothing in this matter. It may be that it is incapable of doing anything, as natural conditions may be against us. But it is difficult to see why we are worse off in this respect than Germany. Energy can be produced as cheaply in this country as in Germany, if not cheaper, and the problem as a commercial matter is largely a question of cheap electrical energy. We have the same ample supply of nitrogen and oxygen in our atmosphere as Germany, and soda is at least as cheap with us.

The whole question needs systematic examination, and it is the object of this article to commend it to the careful and serious consideration of one of the scientific committees which have been established since the outbreak of war. There is surely no more pressing or important problem in the interests of the future welfare of this country, intimately bound up as it is with the prosperity of our agriculture, the oldest and most vital of our industries. We have amongst us men—chemical engineers and electrical engineers—who can deal adequately with this subject, and they could confer no greater national benefit than to enlighten the manufacturing community concerning the possibilities of the synthetic production of nitrates in this country as a commercial enterprise, after a careful and impartial consideration of all available facts.

This is a matter which intimately concerns the Board of Agriculture, and it might appropriately be considered by the Departmental Committee appointed by the president of the Board a few weeks ago "to make arrangements with a view to the maintenance, so far as possible, of adequate supplies of fertilisers for the use of farmers in the United Kingdom." We do not recognise a chemist among the members of the committee, and conclude, therefore, that the possibilities of producing a supply of synthetic nitrates are not to be contemplated. If the omission is deliberate, we suggest that the subject should be taken up by the British Science Guild, or by one of the committees recently appointed by the Government and by scientific societies, so that a definite view of our national position in this matter may be presented and provision may be made for any eventualities which the future may bring, either during the war or in later years.

THE FAUNA AND FLORA OF CENTRAL AMERICA.

Biologia Centrali Americana. Zoology, Botany, and Archæology. Edited by F. D. Godman and O. Salvin. (London: Dulau and Co., Ltd., 1879–1915.)

THE first and last volumes of this magnificent work have recently appeared, and as it is impossible to review adequately sixty-three volumes, even if one took up several numbers of NATURE, the following attempt will be confined to the first or introductory volume, which has recently been issued under the editorship of Mr. Godman.

When this great work was first planned it was estimated that the zoological part would not exceed twelve volumes of five hundred pages each, and that four volumes would suffice for Botany; the inclusion of the Archæology was not at that time contemplated. These sixteen volumes have, however, swollen into sixty-three volumes, including a most valuable contribution by Mr. A. P. Maudslay on the archæology, ruins, and inscriptions of Yucatan.

It is not unusual for a rich patron—a modern Mæcenas—to subsidise publications on an extensive and even lavish scale. It is less usual to find the patron and investigator in one and the same man, but, in fact, it is mainly due to the public spirit and the scientific ardour of Mr. Godman that this very important contribution to biological science has been so successfully carried through.

Godman and Salvin belonged to a small group of Cambridge undergraduates who, in the middle 'fifties, took a keen interest in natural history. In the neighbouring and then undrained fenland they once even chased a buzzard, and "were just too late to catch the 'large copper,' recently become extinct." These youthful naturalists were wont to meet in each other's rooms and discuss their various "finds," and, indeed, it was in Newton's rooms at Magdalene, towards the end of 1858, that Salvin, Simpson, Wolley, Slater, Newton, and others met and passed a resolution founding the Ornithological Union, the journal of which, *The Ibis,* has now reached its fifty-sixth volume.

Salvin had already travelled in northern Africa and northern Europe when in 1857 he paid his first visit to Central America, and first became acquainted with the collectors who were then active in these regions. Two years later he returned again; and two years afterwards Godman joined Salvin on his third expedition to Guatemala. Again in 1867, accompanied by his wife, Salvin returned for a fourth time to Guatemala, and after coming back *viâ* the United States in 1875 was appointed Strickland Curator of the Bird Room in Cambridge.

Salvin's removal to Cambridge necessitated his giving up his house in South Kensington, which had served as a museum and library for the Central American collections, then very rapidly accumulating. To replace this centre a house was taken in Tenterden Street, Hanover Square, and for some years this was the home of hard work and much instructive conversation and debate, for after the scientific meetings of the Zoological Society in the neighbouring square the ornithologists frequently repaired hither to exchange views, criticisms, and ideas.

The area of the New World which is dealt with in this series of monographs "includes the whole of Mexico south of the Rio Grande as far as El Paso, and thence to the Gila river, and following it as far as the Gulf of California." Some of the neighbouring islands the sea-birds of which are common to those in the adjacent mainland are also included. The whole of Central America, comprising British Honduras, Guatemala, southern Honduras, Nicaragua, Costa Rica, and Panama, come within the area. In shape the area has been compared to a cornucopia, narrowing from the northern breadth of 1140 miles to 45 miles at the isthmus of Panama. From a climatic point of view the area is divided into three zones, the Tierra Caliente, the Tierra Templada, and the Tierra Fria, the middle term of which corresponds roughly with an elevation of 3000 to 5000 feet. But these limits vary on the Pacific and the Atlantic coasts, the greater rainfall on the latter producing a much more luxuriant vegetation than is found on the western slopes. Although the present connection between the North and South American continents is by way of the Central American isthmus, the same does not apply to the tectonic connection. Geologically, the true union of North and South America is through the Antilles, these islands being the peaks of a mountain range which forms the true link between the coast ranges of North America and the Andean chain of South America, although even this cannot be said to be a direct continuation of either of them. The isthmus, as a connecting link, is of later date, due to various complex phases of earth-movement, so that the Caribbean Sea, although now forming part of the Atlantic, was in its past history more closely bound up with the Pacific Ocean.

In the region in question, the formations consist of Tertiary deposits, fossiliferous limestones, sandstones, and clays, together with igneous rocks and ashes, these being similar to those found in the coast ranges and in the Andes. Nowhere in the Central American mountains is any pre-Tertiary core exposed, such as is found in many of the mountains of that period elsewhere. The main movements seem to have been completed by the close of the Miocene times, as Pliocene and more recent deposits are only found at comparatively low elevations, and have not been involved in the major movements. The most recent movements have given rise to the coastal plains, which are specially well marked on the Atlantic side of the isthmus.

Although Godman and Salvin between them covered in their travels but a small part of the extensive area in question, Mr. Godman has given a peculiarly complete and fascinating account of the physical feature of the "terrain," the fauna and flora of which they investigated, since the former has rightly used the field-notes and records of their numerous collectors and other naturalists who have worked in Mexico and Central America.

If we exclude the botanical volumes, and Mr. Maudslay's monograph on Archæology, we shall find the work deals in the main with Vertebrate and Insect forms, and among the vertebrate the birds especially stand out. The total number of species of Mammalia is described as 181, and as Dr. Sclater remarked:

> "It may fairly be said that (excluding the introduced Mures), at least one hundred of the constituent species are essentially Neotropical in their character, or have Neotropical affinities, while of the remainder not more than sixty can be said to be decidedly Nearctic. There is, therefore, no doubt that the Central American isthmus, at any rate as far north as Tehuantepec, should be assigned to the Neotropical region."

More than 1400 species of birds were enumerated, of which nearly one-half were endemic. The Reptiles and Batrachia yielded just under 700 species.

As regards the geographical distribution of these animals, Dr. Günther remarks that:—

> "A boundary line between the North and South American regions cannot be drawn. Central America forms a transition-tract, unlike any other part of the world, showing the most extraordinary diversity of climatic, physical, and meteoric conditions within comparatively small areas, favouring the evolution of a great variety of types of genera and species."

Mr. C. Tate Regan has been responsible for an admirable monograph on the Pisces. He also associates Central America with the Neotropical region.

Amongst the Invertebrates, besides the insects mentioned already, the Molluscs form the subject of a monograph by E. v. Martens. Unfortunately the Crustacea have not been studied, the late Prof. T. H. Huxley being unable to finish the fresh-water Malacostraca, which he had hoped to describe. The Spiders, Harvestmen, Scorpions, Pedipalps, and, to a certain extent, Mites and Centipedes, have, however, been fully worked out. As is so often the case, the Beetles, which numbered more than 18,000 species, receive special notice, and indeed the Coleoptera and the Lepidoptera were the only two groups for which sufficient specialists were forthcoming to describe the collections completely. The Hymenoptera, unfortunately, have not been fully examined, and the Bees and Social Wasps have had to be passed by. The Diptera, again, yielded comparatively few species, and the same is true of the Orthoptera.

The whole world benefits by this series of stately tomes, but the debt of our country is even deeper, for all the collections brought together with so much care and cost now repose in the British Museum (South Kensington). We cannot refrain from including the following quotations in this short notice:—

> "All the insects from Mexico and Central America, the Sallé and Janson collections of beetles, our own general collection of birds and butterflies, and the Henshaw collection of birds, have been presented by us to the British Museum, and are being gradually incorporated with the National Collection."
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> "The various accessions are enumerated in detail in vol. ii. of the 'History of the Collections contained in the Natural History Departments of the British Museum' (1906), and in the subsequent annual reports of that Institution. The first instalment of Neotropical birds (50,120 specimens) was presented in January, 1885, and other instalments followed from time to time until the whole of them became the property of the nation. Amongst the insects, up to 1906, the total number of specimens given in the 'History' is as follows; Coleoptera (85,920), Lepidoptera Rhopalocera (17,829), Lepidoptera Heterocera (12,883), Diptera (17,525), Hymenoptera (10,004), Rhynchota Heteroptera (5543), etc. These figures do not include the Rhynchophora or weevils (22,793), the Staphylinidæ and water-beetles (9474), the Odonata (3000), the Rhynchota Homoptera (5509), the supplementary unworked parasitic Hymenoptera (6293), etc. From 1906 onwards the remaining collections have been handed over to the Museum as soon as the enumeration of the species was completed; that of the Coleoptera was finished in 1911. Our own general collection of butterflies probably included nearly 100,000 specimens, and the beetles alone from Mexico and Central America perhaps double that number. Besides these a considerable number of mammals, reptiles, fish, etc., of which no account was kept, were presented to the National Museum."

The "Biologia Centrali Americana" must ever remain a classic. Biological science owes a deep debt to those who planned, designed, financed, and carried out this truly monumental work. In every sense of the word it is a credit to the British nation, and we only wish that Mr. Salvin had lived to share with his collaborator the widespread recognition of the great services they have rendered to their science and to their country.

FOSSIL MAN.

The Antiquity of Man. By Prof. A. Keith. Pp. xx + 519. (London: Williams and Norgate, 1915.) Price 10*s*. 6*d*. net.

THE chief works on the antiquity of man have hitherto been written by geologists and archæologists. Prof. Keith now treats the subject from the point of view of the human anatomist. The available facts and speculations of geology and archæology are all briefly stated and introduced at appropriate stages in the argument; but the anatomical characters of the various known human remains and their significance form the author's main theme. The plan has obvious disadvantages, for the value of the conclusions depends on the authenticity of the materials, which none but an expert geologist can determine. It also fosters a tendency to make dogmatic statements about the age of the various remains in terms of years, which may please a section of the inquisitive public but cannot be admitted as science. At the same time, the human anatomist is an essential factor in unravelling the story of primitive man, and Prof. Keith has produced an important work, which is all the more fascinating since it is the direct outcome of his own personal observations.

The great interest of Prof. Keith's volume, indeed, depends on the insight it affords into the methods and aims of modern research in prehistoric anthropology. It is sometimes technical and tedious, but the whole is written with the inspiring enthusiasm of an investigator, and it is enlivened by many personal touches when describing the circumstances of the different discoveries. The general reader will also be much helped in the comparison of the human skulls and jaws by the author's method of placing his numerous figures in rectangular frames of standard size.

Prof. Keith begins with the long-headed men of Neolithic times, and observes that they exhibit no primitive features in their skeleton. He de-